

a year on an average. Since the establishment of this station in 1871, the mean number of foggy days dense enough to obscure objects a thousand feet distant has averaged nine for the entire year in San Diego.

During the late spring and early summer months the moisture-laden sea breeze carries over the land, not "tons upon tons of water," but of vapor that is visible as stratus cloud at from 500 to 1,000 feet altitude, and the cloud layer is so thick as to modify, and in some instances practically nullify insolation. At such times the sunlit bases of the mountains, 15 to 20 miles distant, beyond the cloud layers, can be readily seen. The temperature beyond the low cloud limit is frequently from 25° to 30° above the temperature at San Diego. That the thick stratus cloud presents quite an obstacle to the sun's rays is shown by the thermograph trace, which, during these not infrequent days, registers a horizontal line with but two or three degrees variation. This cloud is locally known as "high fog," which is but a popular definition of stratus cloud. The relative humidity near the earth is about normal during these times, ranging from 70 to 80 per cent.

Fog at the ground level is beneficial to orchards only in so far as it freshens the leaves and prevents evaporation from the soil. That it can never do much to supplement irrigation, nor the direct work of rainfall in watering the soil, is apparent when the infrequency of fog dense enough to deposit even 0.005 of an inch is considered. In addition to the normal rainfall of 10 inches, about a quarter of a million gallons of water for each acre is needed annually for citrus fruit. Allowing 80 trees to the acre, it is readily seen how insignificant the water condensed from a few foggy nights would be to a tree requiring more than 3,000 gallons as an annual water supply.

#### THE FLOOD OF JANUARY, 1880, AT BASSETTERRE, ST. KITTS, W. I.

By WILLIAM H. ALEXANDER, Observer, Weather Bureau.

While strolling one morning along the streets of this city the writer's attention was attracted to a plain, massive monument in the cemetery on which he read the following inscription: "Sacred to the memory of those who perished in the flood in Basseterre, St. Christopher, on the 12th of January, 1880, and commemorative of that awful visitation, in which 231 persons lost their lives, of whom 101 are buried here."

Beyond the mere facts as to dates and results, as set forth in the above inscription, there seems to be no official record bearing on the event, and I have compiled the following lines by the help of the memory of eyewitnesses:

It seems there were no premonitory signs of the impending disaster further than toward sunset an unusual warmth was felt which continued up to 9 o'clock p. m., when "an intense cold set in," then a light shower of rain fell. The clouds gathered early in the evening, and very soon the city was enshrouded in intense darkness. "The darkness could almost be felt."

Occasional flashes of lightning accompanied by "deep rumbling thunder" now and then relieved the painful feeling. About 11 o'clock the rain began again, and eyewitnesses say it "looked like sheets of water pouring out of the clouds." Soon the place was flooded, and ere long the water began to creep into the houses, to the great consternation of the inmates, who, upon attempting to escape, found the streets like rivers, making egress not only unsafe but well-nigh impossible. Those who were so fortunate as to possess an "upstairs" availed themselves of the security afforded by a more elevated position, but unfortunately the great bulk of the population lived then, as now, in little one-story, one-roomed houses (if one can call them houses at all) built of light material and loosely put together, so that soon houses and

all began to move seaward. The rain continued for about four hours, resulting as above indicated in the drowning of 231 persons certainly, and possibly more, beside the loss of property.

Many were buried beneath a layer of mud several feet deep that came down from the fields and mountains.

Of course, all gages and marks by which the amount of the precipitation could be measured or estimated, were either swept away completely or entirely submerged, and only individual opinions on this point can now be had. It is estimated that 23 inches fell within the four hours, and this augmented by the overflowing of the mountain streams, caused the great destruction of life and property. As in the days of ancient Babel so these people have attempted to fortify against any further disaster of this kind, not by erecting a tower but by encircling the city with a stone wall intended to check and divert the mountain streams into other channels.

[It is very much to be desired that the observers, located at stations whose climate is but little known to the citizens of the United States, should compile brief abstracts of all available records bearing on the climatology of such locations, especially matters affecting commerce, agriculture, and hygiene, or instructive from the point of view of the theoretical meteorologist. It requires much previous reading and study to prepare oneself for profitable scientific work when traveling into distant regions. Our observers at isolated stations, who are perhaps not confident of remaining long at any one place, can best begin their local studies by the collection of past records and by personal acquaintance with older local observers. Original manuscript records of work done in the tropical regions are very likely to be destroyed by mold and insects, even if not lost through neglect. The preservation of these original records is highly desirable, as they have never or rarely been published in full and contain the data for many important researches. Such manuscripts are doubtless worth asking for with a view to their future preservation in the fireproof vaults of the Weather Bureau. Many stations recently occupied by the Weather Bureau have also been previously occupied by other observers, and for the sake of the continuity of record, it is vitally important to institute a careful comparison between the old and the new instruments and the peculiarities of their respective localities.—Ed.]

#### DERECHO, NOT TORNADO, OF MAY 16 IN OHIO.

By J. WARREN SMITH, Section Director.

At about noon on May 16 a wind squall entered northwest-ern Ohio and passed eastward across the State at the rate of about 50 miles an hour. It unroofed and damaged many buildings, leveled fences and a large number of oil derricks, and broke down orchard, shade, and forest trees.

The first damage noted in this State was in the western part of Gorham township in Fulton County, where a school house was blown down and several pupils injured. The following items from the teacher, Miss Fisher, will prove of interest:

The building in which I was teaching was a brick structure, put up in the cheapest possible manner, size about 28 by 34. The storm came up from the west and traveled in a southeasterly direction, the wind being from the southwest. It had the appearance of an ordinary heavy rain and wind storm. The storm had passed to the north when the wind turned to the northwest. It blew straight ahead as was conclusively proven by the fact that it did not pick up anything from the ground, not even disturbing a stick of wood on the wood pile. The wind seemed to dip and sweep the ground for 50 or 100 rods, then rise and pass over a mile or more, then fall again. I have no definite idea of the velocity of the wind, but it blew very hard and lasted one or two minutes; it was accompanied by a deluge of rain. The school building was a complete wreck, valued, together with its contents at about \$1,000. There were 25 scholars within, of whom 5 were seriously and 8 slightly injured.

The voluntary observer at Wauseon, Fulton County, states:

A heavy thunderstorm, with high wind, struck here just after noon, filling the air with sand so I could not see 15 rods. Some trees were broken down and two barns unroofed, one two miles east of here and the other four miles northwest. It was not a tornado, but a straight wind.

Wauseon is about 17 miles southeast of the schoolhouse mentioned above.

At Toledo the wind was 44 miles an hour from the northwest.

At Cleveland the maximum on that day was 58 miles from the west.

The observer at Green Spring, in Seneca County, writes:

Its path was about three-eighths mile wide at some points; one-half mile at others.

Mr. W. F. Miller, of Siam, Seneca County, writes:

The storm struck here at 2 o'clock. A number of barns were unroofed at a point three miles east of Bloomville. The wind was a straight blow, with no hail. The clouds were of a light yellowish green; lightning accompanied the storm.

He incloses a diagram which showed that the storm moved southeasterly, and that there were points of greatest severity at irregular distances of from one to five miles apart.

Prof. H. V. Egbert, voluntary observer at Bouchtil College, Akron, Summit County, writes as follows:

The storm was not of a tornado character. It had been raining a little, with light wind from the southwest, when it suddenly shifted so as to come from the north 60° west. It reminded me very much of the wind which frequently springs up after a thunderstorm when the low has passed and the northwest wind sets in vigorously. There were low clouds and some darkness therefrom, but they were clouds of smoke which had settled over the city and as soon as they blew away it was lighter. The nimbus were at an average height and they disappeared with the approach of the wind, leaving the higher stratus, from which no rain fell. In other words, the wind was not accompanied by rain. There was no joining of clouds, as is supposed to exist in a tornado. I saw the whole affair from the third story of the college building, which stands on the highest ground in the city. There was no lightning, though in the night following a thunderstorm occurred. It was simply a good old-fashioned straight blow, though a severe one.

Reports from voluntary observers in Portage, Mahoning, and Columbiana counties show considerable local damage, Mr. T. R. Snowden, postmaster at Wellsville in Columbiana County, writes:

The damage done in this section was caused by the wind alone. The wind had a twisting movement, uprooting trees and catching up great quantities of water from the river and scattering it in spray.

Newspaper reports indicate that the west gable of a schoolhouse which stood in the Keefer District near Canal Fulton, Stark County, was blown in and several of the pupils seriously injured. This occurred at 3:15 p. m.

Other damaging thunder and hailstorms occurred later in the afternoon and evening over the same district. In southern Wayne and northern Holmes counties, hail destroyed much glass, broke slate, perforated iron roofs, and killed some sheep.

Some interesting facts in connection with this storm are:

(a) The storm occurred in the northeast quadrant of a cyclonic area, yet had the characteristics of a "line" squall, such as occur near the western edge of a sirocco wind area, where the overrunning colder winds cause the most unstable condition of the atmosphere.

(b) The absence of the generally-accepted characteristics of the tornado, although most newspapers and some observers gave it that name. A study of its course shows that it was widespread, covering much more territory than is ever covered by a tornado.

(c) The apparent rising from and dipping down to the earth of the severest winds.

(d) The meteorological conclusions announced by the newspaper reporters and the universal exaggeration of accounts of damage were more remarkable than usual.

## BALLOON ASCENSIONS ON MARCH 24, 1899, IN FRANCE.

[Abstract from L'Aerophile, April, 1899, by Prof. F. H. BIGELOW.]

On March 24, 1899, five balloons were sent up in France, three, unmanned, under the direction of M. Teisserenc de Bort; one, unmanned, in charge of M. Gustave Hermite, and one, manned, carrying MM. Bezançon et Le Cadet. The results of these ascensions were interesting on account of several practical experiences, which it will be well for those planning such voyages of exploration in the upper air to bear in mind.

(1). The first unmanned balloon was of 100 cubic meters. It was launched by M. Raymond, at Trappes, about 8:30 a. m. It drifted east-northeast and landed at Treves, in Rhenish Prussia. At the altitude of 14,000 meters, when the surface temperature was  $-1.9^{\circ}\text{C}$ ., the balloon thermometer recorded  $-52.9^{\circ}\text{C}$ ., a fall of  $0.364^{\circ}$  per 100 meters.

(2). The second balloon, of the same size, was launched by Teisserenc de Bort, near Limoges, at 9.27 a. m. It moved north-northeast 59 kilometers and landed at Péroles (Corrize). At the height of 8,600 meters, for a surface temperature of  $+0.3^{\circ}\text{C}$ ., the temperature  $-44.0^{\circ}\text{C}$ . was registered at the balloon, a fall of  $0.515^{\circ}$  per 100 meters.

(3). The third unmanned balloon, also 100 cubic meters in size, was launched by Teisserenc de Bort, at 3.45 a. m., from the same place, and it moved 121 kilometers east to Meix-Saint-Epoïn (Marne). For a surface temperature of  $-3.0^{\circ}\text{C}$ ., the temperature at the height of 8,600 meters was  $-52.6^{\circ}$ , a fall of  $0.570^{\circ}$  per 100 meters. The last balloon was sent up before sunrise, in order to determine what influence the sun's rays would have upon the registering thermometers as compared with the similar instruments sent up at 9.27 a. m. The latticework used to protect the thermometers was quite sufficient for this purpose, and the conclusion is drawn that no complicated mechanism is required to agitate the air near the thermometers at high altitudes.

(4). The fourth unmanned balloon, the Aerophile, No. 3, 460 cubic meters capacity, had a disastrous experience. It was sent off by M. Gustave Hermite, from the Champ-de-Mars, but was only *one-third* filled with gas, thus saving expense. It was supposed that the gas would expand at high altitudes enough to completely expand the balloon. It ascended 4,000 meters, meanwhile taking on the form of a parachute, resisting the movement of the balloon upward. It was subjected to violent swayings and shocks, and at that height burst into a thousand pieces, as if the covering had been made of brittle glass, falling near Bagneux (Seine). It is supposed that the low temperature froze the material and made it very fragile, or that possibly a rope became twisted about the globe, preventing its proper enlargement. This experience is considered conclusive against the idea that an unmanned or sounding balloon may profitably be started up only partially filled with gas. On recovering the instruments, it was found that with a surface temperature of  $0^{\circ}\text{C}$ ., the temperature at the height of 4,338 meters was  $-33^{\circ}\text{C}$ ., a fall of  $0.700^{\circ}\text{C}$ . per 100 meters.

(5). The manned balloon was the "Balaschoff," carrying M. M. Besançon and Le Cadet, which left Paris at 8:15 a. m. and landed at Loiret (Seine-et-Marne) at 11:15 a. m. For a surface temperature of  $-3.4^{\circ}$  at the height 4,014 meters a temperature of  $-31.6^{\circ}$  was observed, being a fall of  $0.732^{\circ}$  per 100 meters. They had a mercurial barometer, but it was found impossible to read it very accurately on account of the incessant oscillations of the balloon, and they conclude that this difficulty is so persistent in balloon voyages that either the aneroid or self-registering instruments must always be employed. The ventilated Assmann psychrometer was suspended at the end of an arm, 12 feet from the balloon, and it was read by a telescope. The self-register thermometer which agreed with the Assmann at the ground recorded